Table 3-5

SO_2 INCREMENT CONSUMING EMISSIONS FOR **MONTANA** CLASS I AREAS

Source	BaseYear Emissions		Current Year Emissions		Increment Consuming Emissions[1]	
	24-hr[2] [lb/hr]	annual [TPY]	24-hr[3] [lb/hr]	annual [TPY]	24-hour [lb/hr]	annual [TPY]
Basin Electric Power Cooperative - Antelope Valley Station						
Units 1+2	n/a	n/a	3,598	14,282	3,598	14,282
Otter Tail - Coyote Station						
Unit 1	n/a	n/a	5,077	17,281	5,077	17,381
Great River Energy - Coal Creek Station						
Unit 1[4]	n/a	n/a	4,195	14,332	4,195	14,332
Unit 2[4]	n/a	n/a	3,552	12,817	3,552	12,817
PPL Corp. - Colstrip (Montana)						
Unit 3	n/a	n/a	672	2,945	672	2,945
Unit 4	n/a	n/a	640	2,804	640	2,804
Minnkota Power Cooperative - Milton R.Young Station						
Unit 1	4,208	14,176	5,575	18,788	1,367	4,612
Unit 2[5]	4,970	18,092	6,128	21,499	1,158	3,407
Basin Electric Power Cooperative - Leland Olds Station						
Unit 1	3,469	11,869	4,931	16,833	1,462	4,964
Unit 2	6,575	19,999	10,179	30,947	3,604	10,948
Montana Dakota Utilities Co. - Heskett Station						
Unit 1[6]	590	1,734	348	1,022	(242)	(712)
Unit 2	1,628	3,895	831	1,993	(797)	(1,902)
Great River Energy - Stanton Station						
Unit 1	1,989	6,178	2,456	7,629	467	1,451
Unit 10	n/a	n/a	320	1,107	320	1,107
Gas Processing Plants						
Grasslands	n/a	n/a	273	n/a	273	n/a

Source	BaseYear Emissions		Current Year Emissions		Increment Consuming Emissions[1]	
	24-hr[2] [lb/hr]	annual [TPY]	24-hr[3] [lb/hr]	annual [TPY]	24-hour [lb/hr]	annual [TPY]
Little Knife	n/a	n/a	427	n/a	427	n/a
Dakota Gasification Plant						
Greatplain Synfuels	n/a	n/a	3,323	n/a	3,323	n/a
TOTAL	**23,429**	**75,943**	**52,525**	**164,277**	**29,096**	**88,435**

[1] Negative numbers indicate increment expanding emissions (*i.e.*, current year emissions are lower than base year emissions).

[2] Annual numbers are based on the Annual Emission Inventory Reports from 1977-1978 (e.g., *avg* S, annual coal use) and AP-42 emission factors. 24-hr numbers are based on the ratio of the annual average emission rate (from 1999-2000 CEMS data) to the 90th percentile 24-hr emission rate (from 1999-2000 CEMS data) applied to the annual average emission rate in the base year.

[3] Based on the 90th percentile of the 24-hr average from 1999 and 2000 CEMS data.

[4] Based on 2000 CEMS data only.

[5] Unit 2 had only been operating 9 months in 1977 and those 9 months were not considered representative of actual operation. Therefore, allowable emissions were used to determine 1977 emissions. See 45 FR 52718, col. 3, August 7, 1980. 1978 emissions are based on an emission factor of 16.8 S for NSPS boilers (see AP-42, Table 1.7-2).

[6] Current year emissions based on 2000 CEMS data only. Unit 1 does not report to the Acid Rain Database; hourly CEMS data were only available for 2000 from the State.

3.4 Increment Expanding Emissions

We modeled six major sources as increment-expanding sources. Montana Dakota Utilities Co's Heskett Station had a reduction in actual emissions since the minor source baseline dates (12/17/77 for North Dakota and 3/26/79 for Montana) and its emissions were therefore modeled as increment expanding. Five other sources in North Dakota shut down after the applicable minor source baseline dates (12/17/77 in North Dakota and 3/26/79 in Montana). These sources include the Amerada Hess Tioga Gas Plant, Basin Electric Power Cooperative's Neal Station (Units 1 and 2), Flying J Inc.'s Williston Refinery, Montana-Dakota Utilities Co.'s Beulah Station (Units 1-2 and 3-5), and the Royal Oak Briquetting Plant (Units 1, 2 and 3).

For the five sources that shut down since the minor source baseline dates, we modeled the same emission rates the NDDH used in their 1999 draft analysis and outlined in Table 3-6.

Table 3-6
SO_2 INCREMENT EXPANDING EMISSIONS

Source	Increment Expanding Emissions	
	ND modeled annual [g/s]	annual [TPY]
Basin Electric Power Coop. - Neal Station	37.4	1,301.5
Montana-Dakota Utilities Co. - Beulah Station	78.2	2,721.4
Flying J Inc. - Williston Refinery	5.7	198.4
Amerada Hess Tioga Gas Plant	62.9	2,188.9
Royal Oak Briquetting Plant	68.9	2,397.7
TOTAL	**253**	**8,808**

4. Results

The Calpuff modeling results are shown in Tables 4-1 through 4-5. To determine PSD compliance these modeled results are compared with the applicable Class I increments.

The PSD increments for SO_2 are specified in section 163(b) of the Act. For Class I areas, those increments are:

annual arithmetic mean.....2 $\mu g/m^3$
twenty-four hour average.....5 $\mu g/m^3$
three hour average.....25 $\mu g/m^3$.

For any averaging period other than an annual averaging period, section 163(a) of the Act allows the increment to be exceeded during one such period per year. Otherwise, section 163 of the Act provides that the increments are not to be exceeded and that the State Implementation Plan must contain measures assuring that the increments will not be exceeded in the future. In the following tables, the number of exceedances indicates the number of times in each year that Calpuff predicted concentrations exceeding the applicable increment. Any number larger than one indicates a violation of the Class I increment.

Table 4-1. Calpuff Class I Increment Results
TRNP-South Unit
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	36.4	31.4	25.6	35.0	29.9
High, 2nd High	31.4	30.0	< 25	25.1	< 25
Max # of Exceedances	4	2	1	2	0
24-hr Predictions					
Highest	14.1	15.3	6.9	8.5	10.1
High, 2nd High	12.8	8.5	5.4	7.3	7.7
Max # of Exceedances	8	7	2	5	10

Table 4-2. Calpuff Class I Increment Results
TRNP-North Unit
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	29.4	30.7	33.8	32.3	32.0
High, 2nd High	29.0	28.5	27.7	< 25	31.4
Max # of Exceedances	2	2	3	1	2
24-hr Predictions					
Highest	12.3	11.9	12.1	13.1	13.4
High, 2nd High	10.5	9.2	7.0	7.9	9.6
Max # of Exceedances	9	7	6	8	7

Table 4-3. Calpuff Class I Increment Results
TRNP- Elkhorn Unit
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	< 25	< 25	< 25	25.8	35.7
High, 2nd High	< 25	< 25	< 25	< 25	< 25
Max # of Exceedances	0	0	0	1	1
24-hr Predictions					
Highest	9.4	11.5	< 5	6.5	11.9
High, 2nd High	6.9	7.1	< 5	6.4	11.4
Max # of Exceedances	5	6	0	5	6

Table 4-4. Calpuff Class I Increment Results
Lostwood Wilderness Area
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	< 25	< 25	31.5	< 25	25.6
High, 2nd High	< 25	< 25	< 25	< 25	< 25
Max # of Exceedances	0	0	1	0	1
24-hr Predictions					
Highest	7.6	9.1	8.9	5.9	6.4
High, 2nd High	6.6	6.8	7.7	5.5	6.4
Max # of Exceedances	7	10	8	4	7

Table 4-5. Calpuff Class 1 Increment Results
Medicine Lakes Wilderness Area
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	26.0	< 25	< 25	< 25	< 25
High, 2nd High	25.9	< 25	< 25	< 25	< 25
Max # of Exceedances	2	0	0	0	0
24-hr Predictions					
Highest	6.3	< 5	8.0	6.4	6.1
High, 2nd High	< 5	< 5	5.0	5.9	5.1
Max # of Exceedances	1	0	2	2	3

Table 4-6 Calpuff Class 1 Increment Results
Fort Peck Reservation
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	27.9	< 25	< 25	< 25	< 25
High, 2nd High	< 25	< 25	< 25	< 25	< 25
Max # of Exceedances	1	0	0	0	0
24-hr Predictions					
Highest	7.4	< 5	11.8	6.2	7.0
High, 2nd High	6.2	< 5	5.5	5.2	6.3
Max # of Exceedances	2	0	2	2	3

Table 4-7
Calpuff Class I SO_2 PSD Increment Results
Summary of 5-year Maximum Values (1990-1994)
($\mu g/m^3$)

	TRNP South	TRNP North	TRNP Elkhorn R.	Lostwood Wilderness	Med. Lake Wilderness	Ft. Peck Reservation
3-hr Predictions						
Highest	36.4	32.3	35.7	31.5	26.0	27.9
High, 2nd High	31.4	31.4	< 25	< 25	25.9	< 25
Max # of Exceedances	4	3	1	1	2	1
24-hr Predictions						
Highest	15.3	13.4	11.9	9.1	8.0	11.8
High, 2nd High	12.8	10.5	11.4	7.7	5.9	6.3
Max # of Exceedances	10	9	6	10	3	3

4.1 Results Using Regulatory Default Input Values

EPA conducted a sensitivity test to show the difference in predicted concentrations compared to a regulatory default application of the Calmet and Calpuff models. With the exception of directly monitored North Dakota values (e.g. mixing height, O_3/ NH_3 background concentrations, etc.), all IWAQM recommendations were selected, and the unrevised EPA regulatory version of the model was used. The results of this test run are shown in Table 4.1-1. From the table it can be seen that the regulatory default selections result in higher predicted concentrations than the selections used in the current study. Non-IWAQM parameters related to the method of dispersion (MDISP, MPDF) were responsible for a large portion of the observed differences. EPA based its selection of non-IWAQM settings largely on the NDDH testing of the model. In these tests Calpuff/Calmet model predictions were compared with observed concentrations for two SO_2 monitoring sites located in and near the Theodore Roosevelt National Park located in western North Dakota. The evaluation was limited by the lack of representative monitoring sites so that a full evaluation using American Meteorological Society performance statistics could not be generated, and predictions/observations were not paired in time. Given the relatively sparse set of SO_2 monitoring data that has been used in testing the model, EPA solicits public comment on which default values should be used in the final modeling to complete the current study.

Table 4-8
Calpuff PSD Increment Analysis
Comparing Modeling Results Using Regulatory Defaults (bold) and Locally Developed Input Settings.

1990 Modeling Results	**TRNP South**	**TRNP North**	**TRNP Elkhorn R.**	**Lostwood Wilderness**	**Med. Lake Wilderness**	**Ft. Peck Reservation**
3-hr Predictions						
Highest	**61.5** /36.4	**35.1** /29.4	**27.5** /< 25	**31.2** /< 25	**< 25** /26.0	**25.5** /27.9
High, 2nd High	**45.1** /31.4	**33.1** /29.0	**25.8** /< 25	**< 25** /< 25	**< 25** /25.9	**< 25** /**< 25**
Max # of Exceedances	**12** /4	**9** /2	**2** /0	**1** /0	**0** /2	**1** /1
24-hr Predictions						
Highest	**22.4** /14.1	**15.2** /12.3	**8.8** /9.4	**8.4** /7.6	**< 5** /6.3	**5.6** /7.4
High, 2nd High	**18.6** /12.8	**13.8** /10.5	**8.4** /6.9	**7.7** /6.6	**< 5** /<5	**< 5** /6.2
Max # of Exceedances	**16** /8	**14** /9	**6** /5	**9** /7	**0** /1	**1** /2

5. Conclusion

In summary, EPA has applied the Calmet/Calpuff model to assess increment consumption in four Class I areas in North Dakota and eastern Montana. We based our analysis on long-standing EPA methodologies, including the use of two years of actual emissions data and five years of historical meteorology data. We employed the locally-developed inputs for the model used by the North Dakota Department of Health (NDDH) in their draft 1999 analysis. The results of our analysis show numerous violations of the Class I PSD increments for SO_2 in all four Class I areas assessed. Specifically, the number of violations in each Class I area are shown below:

Table 5-1: Summary of Class I Violations

	3-hr Predictions 2nd High	3-hr Predictions # Violations	24-hr Predictions 2nd High	24-hr Predictions # Violations
Theodore Roosevelt National Park, South Unit	31.4 μg/m³	3	12.8 μg/m³	9
Theodore Roosevelt National Park, North Unit	31.4 μg/m³	2	10.5 μg/m³	8
Theodore Roosevelt National Park, Elkhorn Unit	<25 μg/m³	0	11.4 μg/m³	5
Lostwood Wilderness Area	<25 μg/m³	0	7.7 μg/m³	9
Medicine Lakes Wilderness Area	25.9 μg/m³	1	5.9 μg/m³	2
Fort Peck Indian Reservation	<25 μg/m³	0	6.3 μg/m³	2
EPA's Class I SO2 Increments	25 μg/m³		5 μg/m³	

Note that, under EPA's PSD regulations, one exceedance of the short term (3-hour and 24-hour) increments is allowed per year, which is why Table 5-1 identifies the modeled second high concentration.

The PSD permitting program and the State's Implementation Plan, or SIP, are the mechanisms intended by Congress for protecting the PSD increments. Specifically, section 161 of the Clean Air Act and 40 CFR 51.166(a)(1) provide that the SIP must contain emission limitations and such other measures as may be necessary to prevent significant deterioration of air quality. Section 163(a) of the Clean Air Act states that each SIP shall contain measures assuring that the maximum allowable increases over baseline concentrations shall not be

exceeded.

EPA's regulations require States to periodically review their plans for preventing significant deterioration. (See 40 CFR 51.166(a)(4).) If a State determines that an applicable increment is being violated, the State must revise the SIP to correct the violation as required by 40 CFR 51.166(a)(3). In addition, 40 CFR 51.166(a)(2) provides that, if a SIP revision would result in increased air quality deterioration over any baseline concentration, the SIP revision must include a demonstration that it will not cause or contribute to a violation of the applicable increments. Thus, there are several provisions of the Clean Air Act and EPA's regulations which require the protection of the PSD increments.

EPA performed this modeling analysis in order to provide a technical basis for defining the appropriate regulatory actions necessary to address any increment violations. EPA is taking comments from interested parties on this draft report for thirty days. We will consider all comments received before finalizing the results. This draft modeling report does not constitute final agency action; such action may be taken at some point in the future as may be necessary to address any PSD increment violations.